K9® Auxiliary Power Unit (APU)

Opportunities for Fuel Savings, Emissions Reductions and Emissions Trading

Tools for Cleaning Up Illinois Diesel: Technology, Funding and Collaboration

May 2, 2006 Naperville, IL

Ed Arts, Director
EcoTrans Technologies, Inc.

Presentation Outline

- Background on Rail Industry: Locomotive Idling
- APU Technology Description
- Fuel Savings
- Emissions Reductions
- The Ontario Emissions Trading Program
- Transboundary Air Pollution
- Ontario Credit Eligibility Zone
- GPS Technology
- Contact Info

Locomotive Idling

- Locomotives have historically been allowed to idle for extended periods of time when inactive.

- Depending on assignment, locomotives idle anywhere between 8 and 14 hours a day, sometimes even more.

Why do Locomotives Idle?

- Locomotives use water as coolant because:
  - Antifreeze can damage engine bearings, reduces HP output
  - Water is better heat transfer fluid
  - Environmental consequences of antifreeze spill in case of derailment
- Idling protects from freezing by keeping coolant water and lube oil warm.
- Idling keeps the locomotive batteries charged and provides hotel power for the cab crew for heating/AC...etc.
- Prevents locomotive toilet from freezing.
- Ingrained habits.

Costs of Idling

- Millions of gallons of diesel fuel are wasted on idling every year → increasing fuel prices.
- Locomotive engine wear and tear from unnecessary idling → maintenance costs.
- Environmental impacts: in 2003, total emissions from Canadian rail operations were **111,320 Tonnes NOx** and **5,640,000 Tonnes CO_2***
- Significant portion of emissions result from idling. Locomotives idle between 40%-60% of the time.

* Source: 2003 Locomotive Emissions Monitoring Program, Environment Canada & The Railway Association of Canada

K9® APU: The Solution to Locomotive Idling!

- EcoTrans Technologies promotes the use of the **K9® Auxiliary Power Unit (APU)** to reduce locomotive idling.

- The K9® APU system consists of an auxiliary diesel engine/genset and an engine shutdown timer (EST). Together, these two components provide for a significant reduction in main engine idle time.

K9® APU Technology

• The APU safely shuts down the locomotive engine after a prescribed time of inactivity. The system monitors the fluid temperatures, charges the batteries and provides hotel power for cab crew comfort without the need to idle the main engine!

Fuel Savings

Rescue Your Fuel Budget

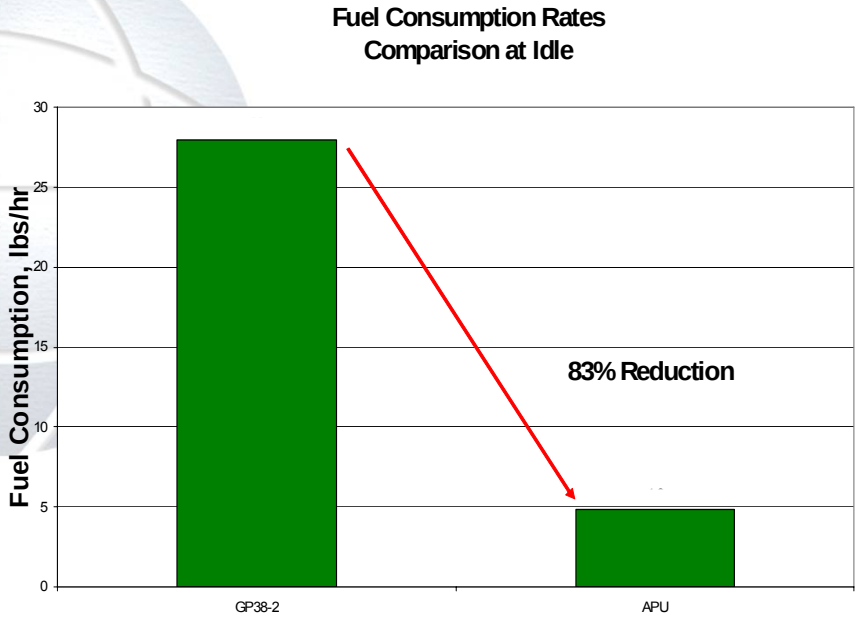
Fuel Benefits

The APU saves fuel and lube oil

- With the APU we can achieve an average fuel consumption reduction of 83%. In fact, the APU does not run all the time when the main locomotive engine is shutdown, hence saving even more fuel!
- In addition, less locomotive idling means less lube oil consumption and less engine wear and tear.

Idle Fuel Savings

(test data from Southwest Research Institute)



Fuel Savings

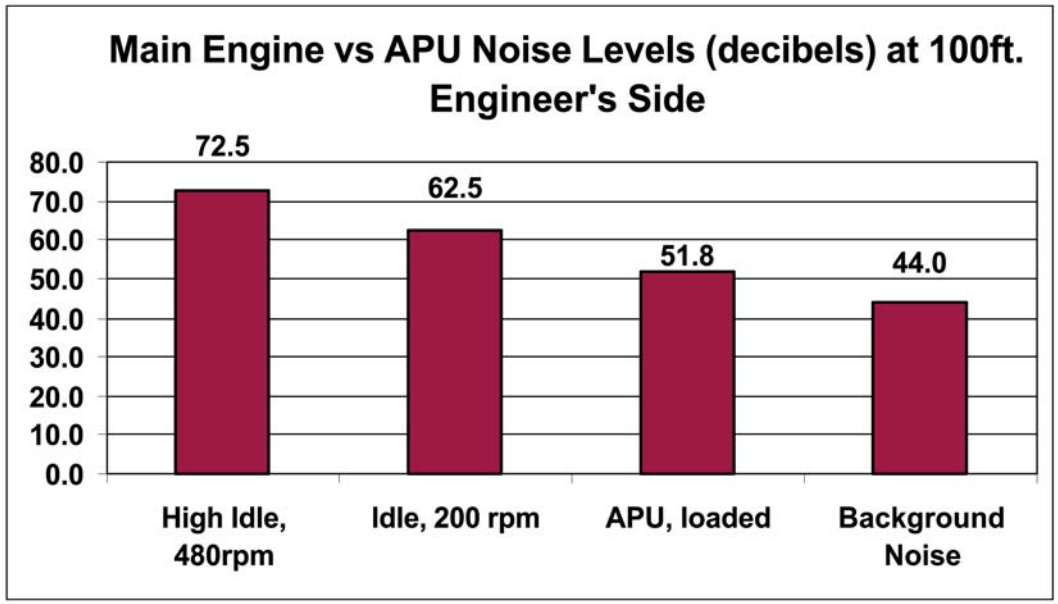
• The amount of fuel savings varies depending on the locomotive duty cycle, weather conditions and battery voltage.

• **Typical fuel savings range between 14,000 gal/yr (for Line-Haul) and 23,000 gal/yr (Switcher).**

• For an average diesel price of $1.39/gallon, this translates to **$19,460 to $31,970 in fuel savings per locomotive per year!**

Noise Level Reduction

• As an added benefit, the APU minimizes noise pollution that is usually associated with rail yards.



- Noise generated from the APU, in normal operating mode with the locomotive carbody doors shut is virtually indistinguishable from normal background noise at a distance of 100 feet.

Recognition for Environmental Excellence

The EcoTrans **K9® APU** is a Technology Category award winner at The EPA…

CLEAN AIR Excellence Awards

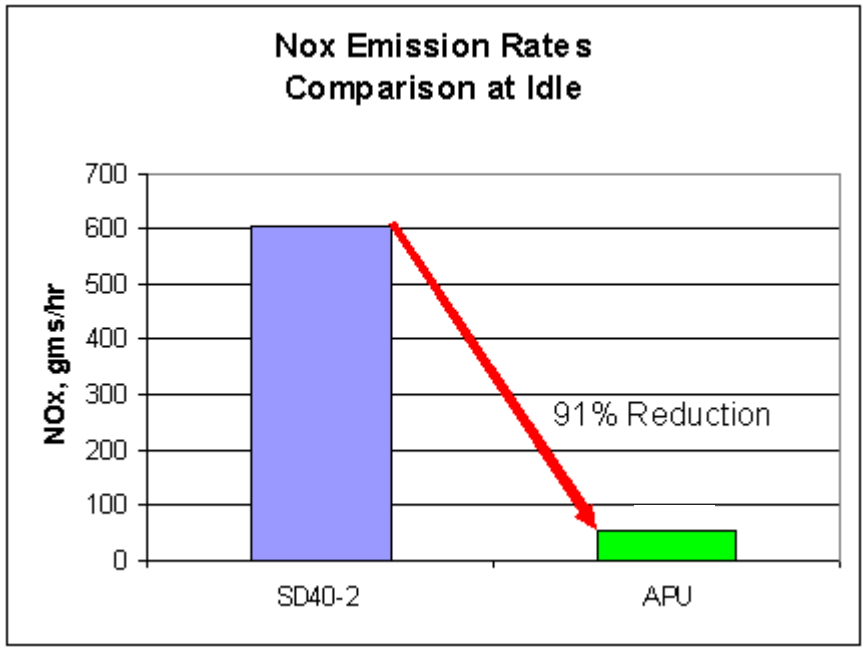
The EcoTrans **K9® APU** is also a 2003 Technology Category award winner of The Texas Environmental Awards

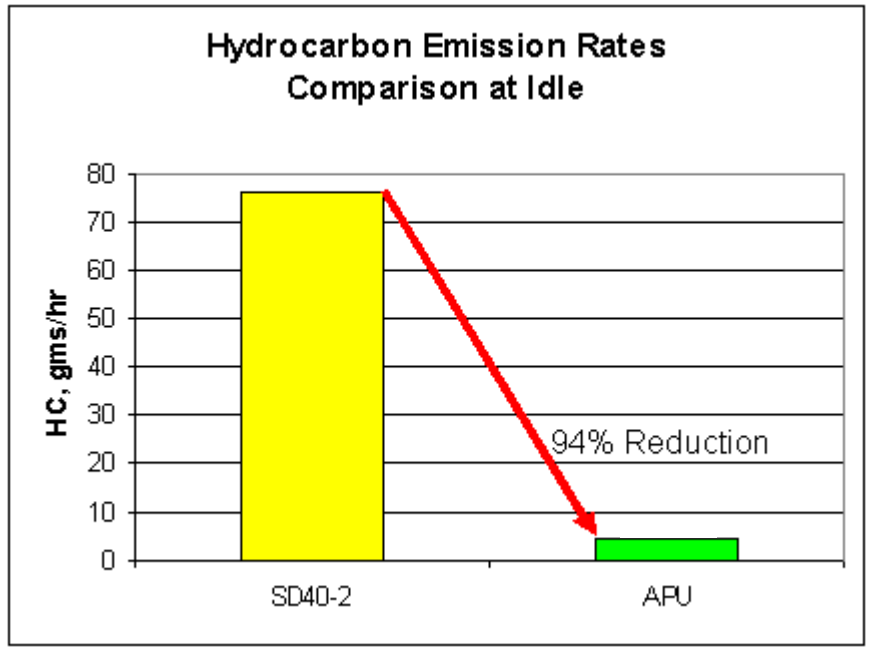
Texas Environmental Excellence Award

Idle Emissions Reductions

(SD40-2 16-645E3 vs APU)

test data from Southwest Research Institute

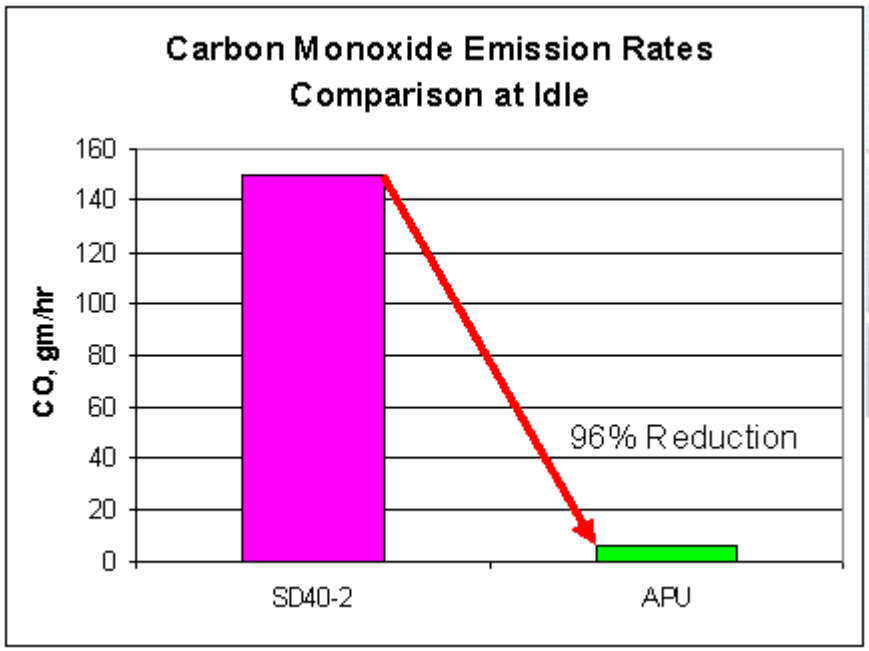


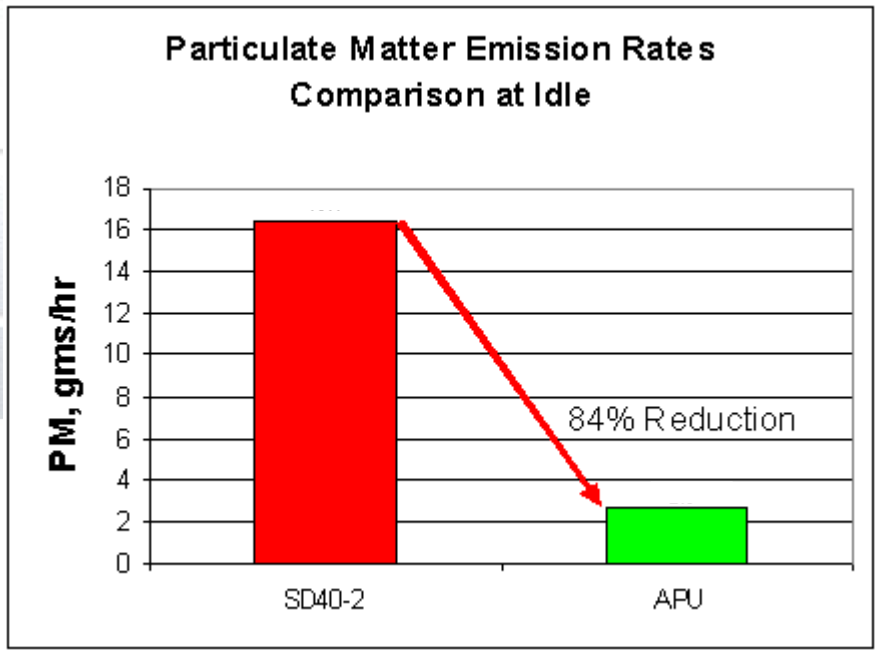


Idle Emissions Reductions

(SD40-2 16-645E3 vs APU)

test data from Southwest Research Institute





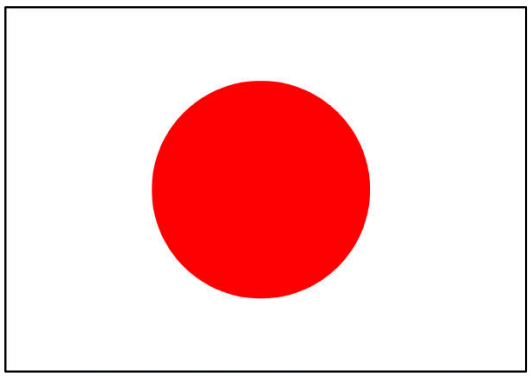
Environmental Excellence

- Reducing locomotive engine idling has tremendous effects in improving air quality in North America.
- The APU can be installed as part of an emission control package certified to meet the EPA's *Tier Zero* standards.
- Environmental protection cannot be ignored in today's economy. Being environmentally-responsible is not only socially beneficial but also economically rewarding!

Great American Inventions

= $$$

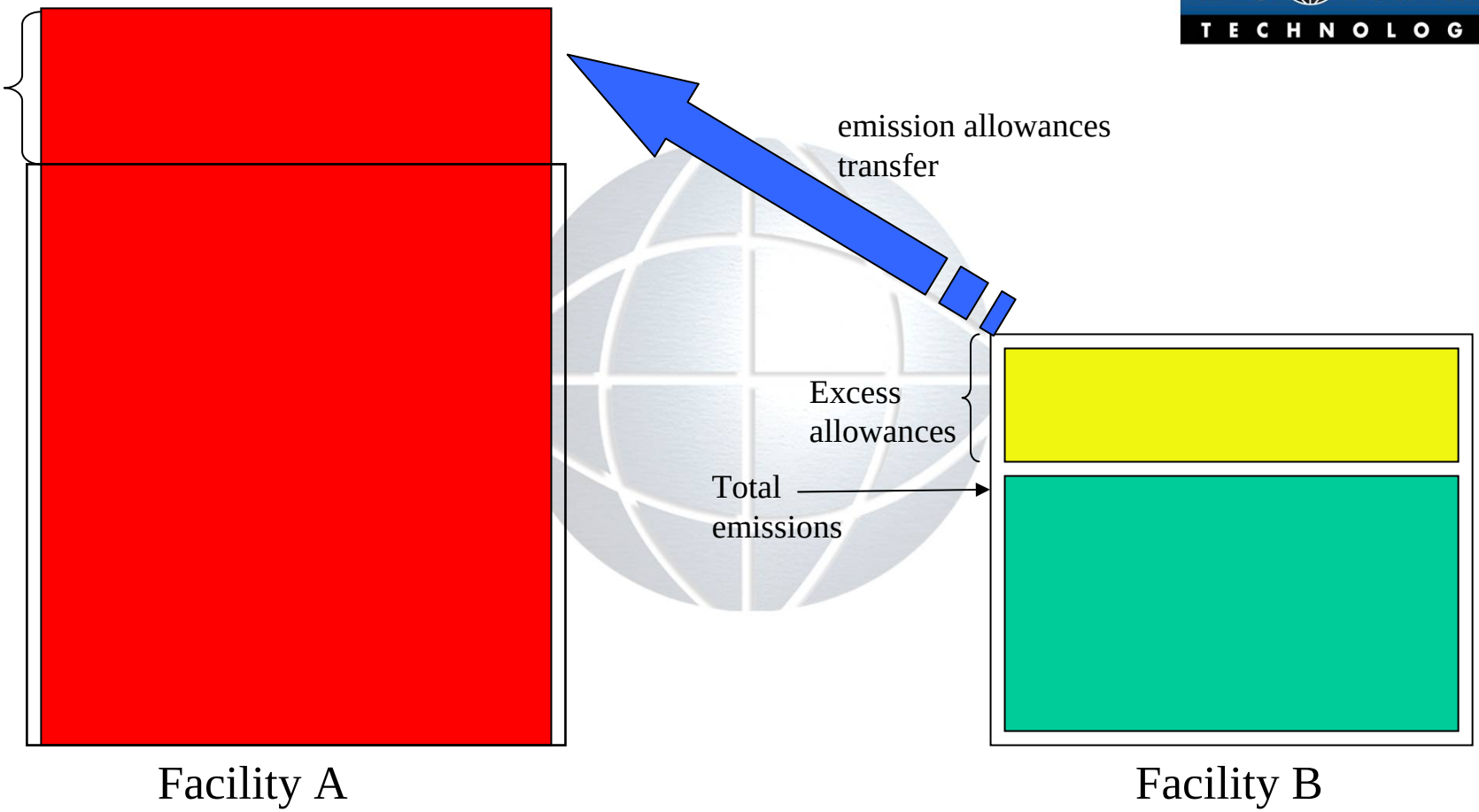
Now accepted or produced by



Emissions Trading

- Emissions Trading is not a new concept. It was developed by environmental economists in the 1970's. It is used in the US as part of the EPA's Acid Rain Program.
- It is currently used by the European Union Emissions Trading System (EU ETS) for GHG emissions cap. Emissions Trading is one of the most important tools of the Kyoto Protocol.
- The theory behind emissions trading is emissions reductions are achieved by the least possible costs. It also creates an economic incentive for companies to reduce their emissions voluntarily.

- Use the "Carrot" instead of the "stick"


Excess emissions
(above cap)
emission allowances
transfer
Excess
allowances
Total
emissions
Facility A
Facility B

Introduction to the Ontario Emissions Trading Scheme

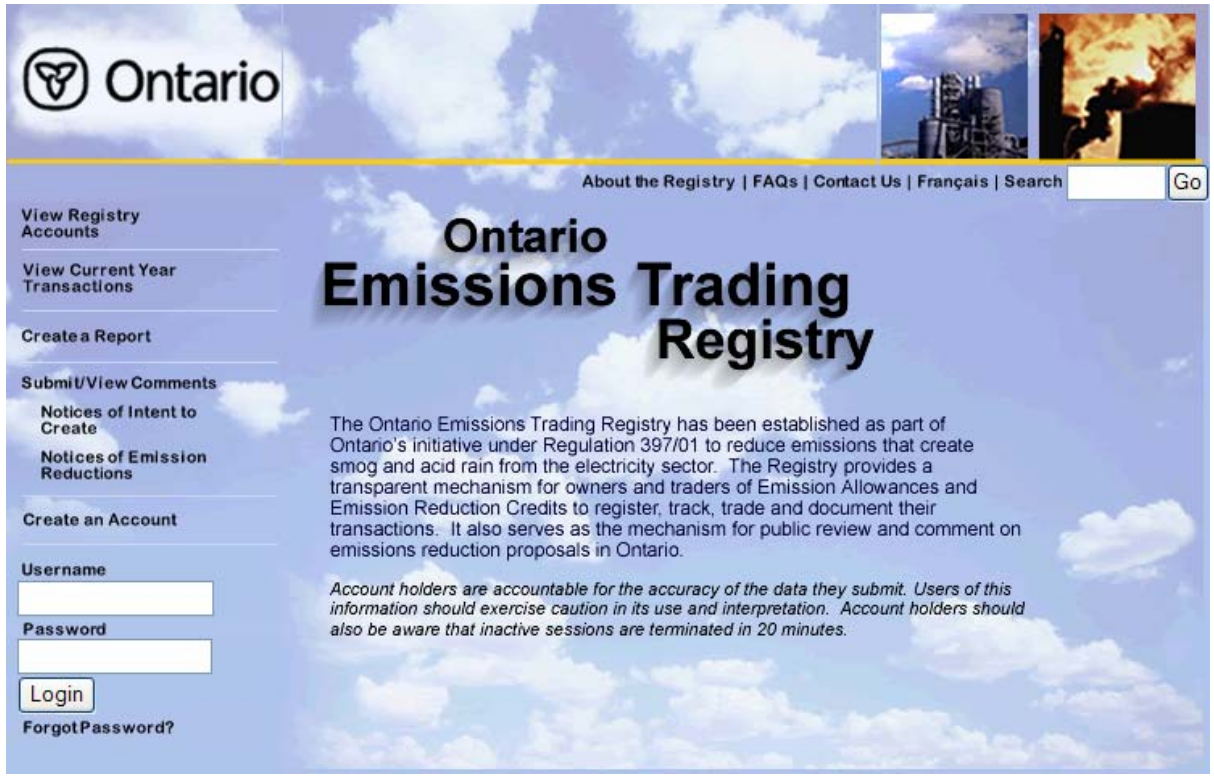
Ontario

• The Government of Ontario has set specific action plans to reduce harmful air pollutants – specifically the smog-causing pollutants Nitrogen Oxides (NOx) and Sulfur Dioxide (SO_2).

• Emissions Trading is one initiative to create an economic incentive for industries to adopt environmentally-benign technology and voluntarily meet their emissions targets. Ontario's emission trading system covers NOx and SO_2.

How does it work?

- All emissions trading are performed according to the Ontario Emissions Trading Code, pursuant to the Ontario Regulation 397/01 under a special emissions trading registry monitored by the MOE to track all transactions.



Emission Reduction Credits

- Non-capped emitters can voluntarily reduce their emissions of NOx and SO_2 and register these emission reductions as "Emission Reduction Credits (ERCs)" that can be sold to capped industries that are in need of compliance.

- There are several capped industries in Ontario, including the power generation sector. Mobile sources are not currently capped. Therefore, emission reductions achieved from APU-equipped locomotives are eligible for "Emission Reduction Credits" or ERCs.

Voluntary emissions reductions (NOx/SO_2) from APU-equipped locomotives

NOx/SO_2 Emission Reduction Credits (ERCs)

Extra Allowances

Capped Facility A

Capped Facility B

Capped Industries under the Ontario Emissions Trading Program

The Standard Method

- In order to register ERCs, the MOE has to accept and verify the application. There are “Standard Methods” or Protocols outlined by the Ontario Emissions Trading Code that describe the acceptable ways of registering ERCs.

- One of these Standard Methods is *“Emission Reductions from the Installation of Idle Reduction System”*. This method was submitted by EcoTrans and was approved by the MOE. This method allows Railroad companies to earn ERCs from the installation of the K9® APU.

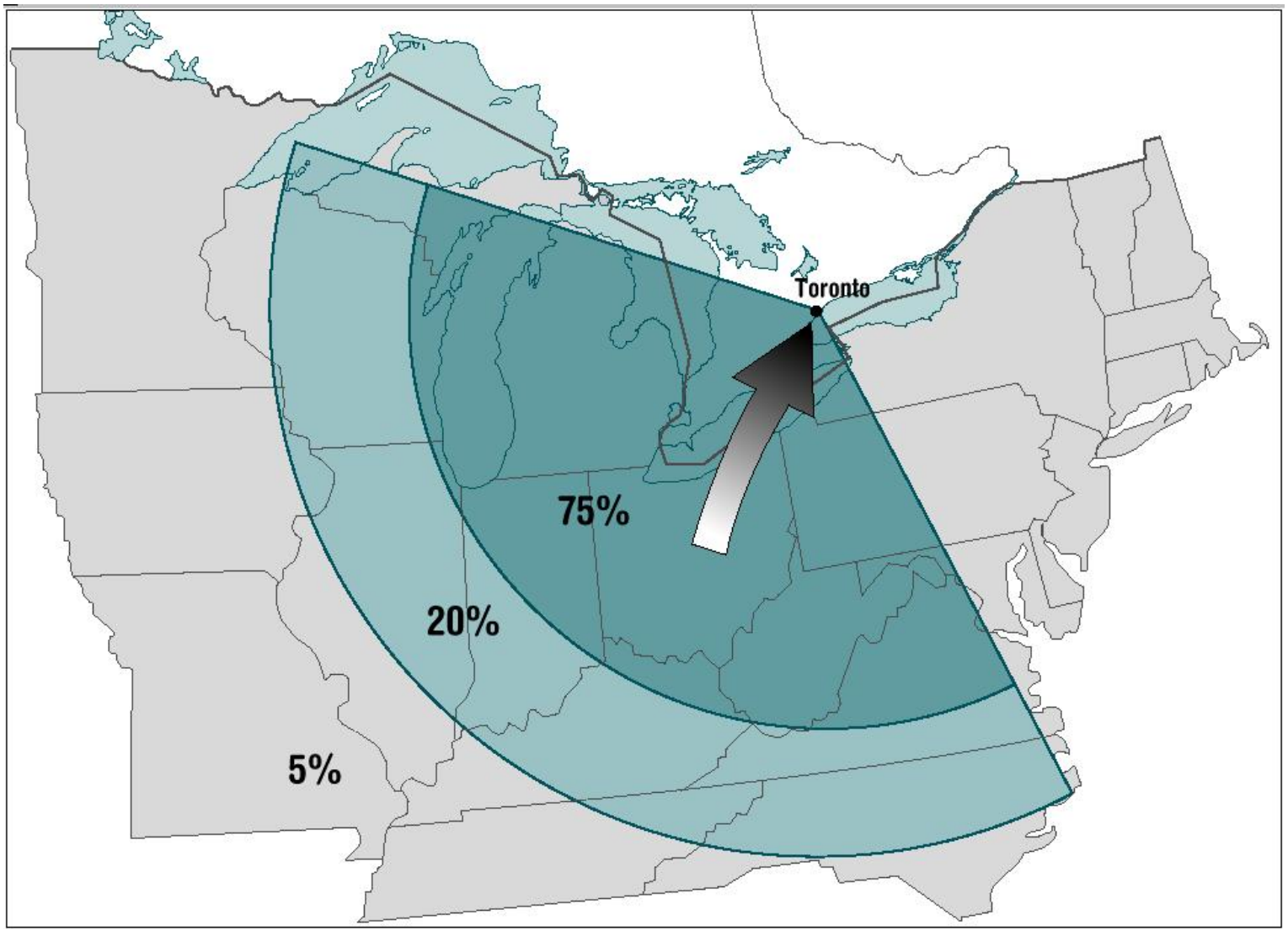
Transboundary Air Pollution

- Emissions do not know borders. Once emitted, NOx and SO2 mix in the atmosphere and travel several thousands of kilometers from their point of origin. Hence, smog is a regional problem, particularly in the Grate Lakes region.

- There have been numerous studies by the Ontario Ministry of the Environment (MOE) that shows that a significant portion of air pollution in the province originates from point sources in the US.

- In certain areas in Southwestern Ontario, the contribution of transboundary pollution from the US reaches as much as 90% !

U.S. Source Regions of Transboundary Ozone into Ontario (Source: Ontario Ministry of the Environment, 1999)

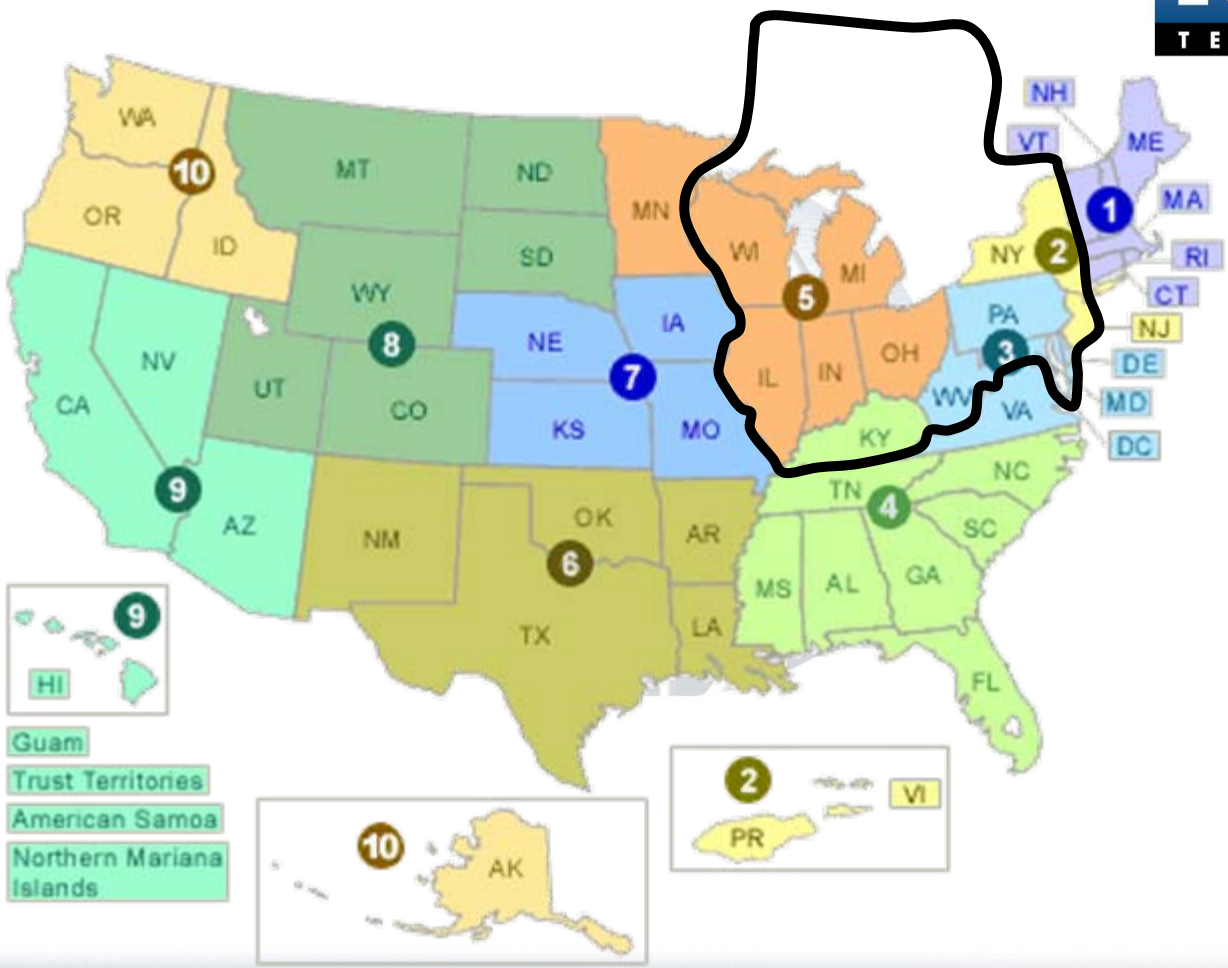


Ontario Credit Eligibility Zone

(Shaded Jurisdictions)

EPA Regions

Ontario Credit Eligibility Zone



Data logging

- EcoTrans provides a communication system with the APU that monitors the operation of the locomotive engine/APU and sends the information regularly to a designated server via satellite connection.

- This allows remote monitoring of the APU-equipped locomotives and properly quantifies emission reductions to be registered with the MOE.

All APU messages are listed below. Click on a message to view details.

MSG ID	MESSAGE TYPE	LOCOMOTIVE	DATE	TIME
8939096	Event	NS 8939	2006/04/05	10:34:08 ADT
8938922	Event	NS 8919	2006/04/05	09:56:49 ADT
8938874	Event	NS 8919	2006/04/05	09:45:19 ADT
8938756	Event	NS 9048	2006/04/05	09:20:34 ADT
8938750	Event	NS 9048	2006/04/05	09:18:44 ADT
8938723	Event	NS 9048	2006/04/05	09:13:54 ADT
8938552	Event	NS 9106	2006/04/05	08:44:29 ADT
8938523	Event	NS 9106	2006/04/05	08:40:24 ADT
8938498	Event	NS 8939	2006/04/05	08:36:23 ADT
8938456	Event	NS 8928	2006/04/05	08:30:04 ADT
8938454	Event	NS 8928	2006/04/05	08:29:29 ADT
8938396	Event	NS 9048	2006/04/05	08:20:19 ADT
8938345	Event	NS 9048	2006/04/05	08:12:19 ADT
8938145	Scheduled	NS 8919	2006/04/05	07:52:59 ADT
8937986	Scheduled	NS 9065	2006/04/05	07:42:14 ADT
8937680	Event	NS 9065	2006/04/05	07:14:49 ADT
8937473	Event	NS 9048	2006/04/05	06:57:44 ADT
8937346	Event	NS 9048	2006/04/05	06:49:04 ADT
8937292	Event	NS 9048	2006/04/05	06:46:19 ADT

Locomotives as a source of mobile emission reduction credits

- *"Locomotive generated emissions are a significant fraction of total mobile source emissions."* **California Air Resources Board**
- New technologies in the market today allow locomotives to reduce idling by a large degree, cutting harmful emissions tremendously.
- Accurate and affordable GPS technologies reduces uncertainty in credit quantification.
- Creates an economic incentive for Class One and short line railroads to reduce emissions.

Why include mobile sources in an emissions trading program?

- Market mechanisms are much more ***effective*** than spending millions of dollars on grants.
- Stimulate ***innovation*** and promote the adoption of low-cost emission reduction technologies in mobile source emitters (locomotives, trucks, buses, automobiles, tractors…)
- Provides ***flexibility*** for stationary emitters (e.g. Power producers) without compromising emission reduction objectives.
- Increased supply of emission offset credits would eventually ***reduce overall costs*** of emission compliance & (electric) energy costs.

Who should get involved?

- EPA
- Congressmen and politicians
- Industry and corporate representatives
- Non-profit environmental organizations

Contact Information

EcoTrans Technologies Inc.

Ed Arts, Director
EcoTrans Technologies, Inc.

1420 Crumlin Road
London, Ontario N5V 1S1
Tel: 1 (800) 565-3509
earts@ecotranstechnologies.com

www.EcoTransTechnologies.com